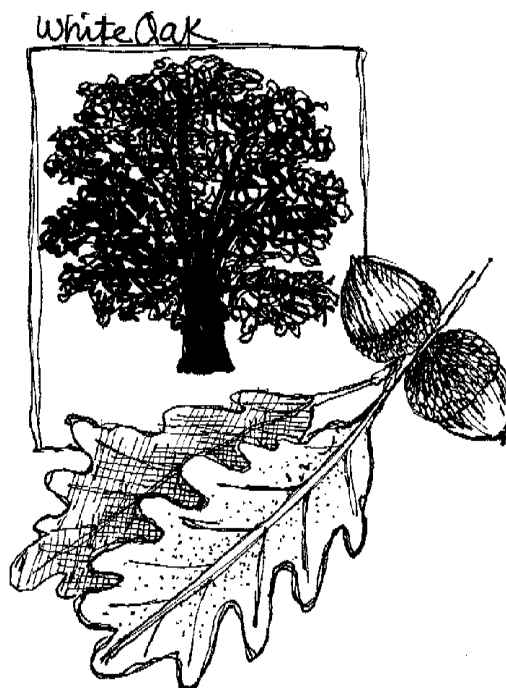




Post-Field Trip Activities



Habitats

Overview

Students extend their learning about habitats by constructing a habitat that they visited at the wetlands.

Duration

Two 30-45 min sessions

Grades

K-3

Benchmarks

- Organism
- Heredity
- Diversity/Interdependence
- Collecting & presenting data
- Analyzing & interpreting results

Key Concepts

By building 3-D habitats, students can share their knowledge of the habitats visited and their understanding of what living things need to survive.

Objectives

Students will be able to:

- create a habitat out of paper, showing plant and animal life
- recognize that plants and animals need food, shelter, air, and water to survive within their habitat

Materials

- construction paper cut into 12" squares, and small pieces to make various parts of the habitat
- scissors
- glue
- crayons
- drawing paper

Background Information

Tualatin River NWR is rich with many different habitats to study. Once students have visited the NWR and have an understanding of what a habitat is, they can create habitats out of paper. Students can focus on individual sites visited, emphasizing what has been discussed and taught by the classroom teacher.

Suggested Procedure

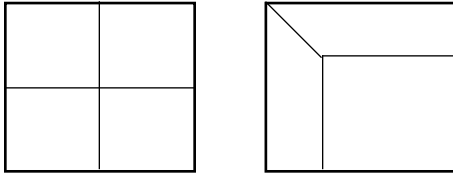
Session One

1. Have students look at their journals or inventory sheets from the Refuge visit. Discuss the plants and animals that they observed while doing the activities at the Refuge. Recall with students that a habitat is the area where an animal or plant lives. In its habitat, a plant or animal finds the food, water and shelter it needs to survive. Have students describe the different habitats that they observed.
2. List the different habitats from the Refuge on the board. Break students up into small groups and assign each of them a habitat to discuss. Ask each group to tell what they saw in that habitat, what animals could live in that habitat, food in that habitat, shelter in that habitat, etc.
3. Have a group leader from each group share the results of their group discussion. List on the board under each habitat some of the important parts of the habitat.
4. Ask students to choose one of the habitats listed on the board to draw. Have each student draw an example of the habitat showing plant and animal life, food, shelter and a source of water. Save these drawings for the next session.

Session Two

1. Review the drawing of a habitat that the students did in the last session. Ask students to check and make sure that they included plant and animal life, food, water and shelter. Students are now going to use their drawings to make a 3D habitat.
2. Give each student a 12" by 12" piece of construction paper to use as a background for a habitat. Have them choose a color that goes with their habitat.
3. Instruct students to fold the paper in half and then in half again. When opened, the square should have four boxes. Demonstrate how to cut on one of the folded lines to the middle of the paper.

Tuck the two flaps one under the other and glue them together, making a small two sided “habitat” with a ground. See the picture below.



4. From their habitat drawings, have students choose key parts that should be in their 3D habitat. Have students cut out these parts from the small construction paper pieces. Show students how to bend back the bottoms of their plants and animals to stand up. Glue all the parts into the 3D habitat. Remind students to show plants, animals, food sources, shelter, the sun, clouds, water, etc. that are all an important part of the habitat.
5. Have students share their habitats in small groups explaining all the different parts of the habitat and why the parts are important.

Assessment Ideas

1. Have students work in pairs and do a comparison of their habitats. Check what is the same and different about each other's habitat.
2. Have students do a Venn diagram comparing their home to the habitat that they built.
3. Have students discuss what else could live in the habitat they built. Could a duck live there? Could a raccoon live there? Could a cat live there? Tell why or why not.

References

Golden Guide Series.

Pond Life; Insects; Reptiles and Amphibians.

Peterson's Field Guide Series.

Western Birds; Mammals.

Pojar & MacKinnon. Plants of the Pacific Northwest Coast.

Arnosky, J. Crinkleroot's Guide to Walking In Wild Places.

Hablitzel, M. & Stitzer, K. Animal Habitats- On Lands, Ponds, Rivers and Oceans Draw, Write, Now.

Class Mural

Overview

Students will work in small groups and draw a habitat they observed while visiting the NWR. They will put all their drawings together to become a large mural of the NWR.

Duration

Two 30 min sessions

Grades

K-2

Benchmarks

- Organisms
- Heredity
- Collecting & presenting data
- Diversity/interdependence

Key Concepts

The NWR offers many different homes to a variety of plants and animals. All these habitats combine to make the NWR a special place.

Objectives

- Students will be able to:
- recall various plant and animal homes that they observed while visiting the NWR.
 - create pictures of habitats that they observed.
 - discuss their drawings.
 - combine their drawings with the rest of the group to create a large mural of the NWR.

Materials

- drawing paper
- crayons
- one large paper for the mural

Background Information

Murals are large paintings applied directly to walls. They can be made up of several smaller pictures put together to form one large picture. Instead of having students paint directly on the wall, have a large piece of paper for the students to attach their smaller drawings to. Each small group of students will have the opportunity to discuss and recall a habitat that they noticed while on their visit to the refuge. Students will then work in small groups drawing or painting that particular habitat. To include several different habitats it would be helpful for the teacher to assign certain areas of the refuge to different groups so that when put together the pictures will make a mural of the entire Tualatin River NWR.

Suggested Procedure

Session One

Following a visit to the Refuge, have a discussion with your class about the different habitats that they saw. Use their wildlife inventories to recall the different plants, animals and insects that they observed.

Divide the class into several groups, giving each group a different habitat to discuss. Have each group recall the animals, plants, and insects from that area. Assign each group to draw the habitat, remembering to put in types of shelter, food sources and water sources. Have each group share their drawings with the class. Have students explain what lived in each habitat and what was needed for survival. Let the class give each group suggestions on what else they could include in their drawings.

Session Two

Explain to the class what a mural is and how they are going to be making one of the habitats that they visited. Have the students meet again with their groups. Students need to look again at their drawings and each decide a part they will add to the mural.

When students are ready, have them work together on the mural, reminding them that each part they color is an important piece of a whole picture of the habitats. When the mural is finished, discuss with students their favorite part of the visit to the Refuge.

Assessment Ideas

Have students share the drawings that their group came up with. Discuss plants and animals within the habitat, food sources, water sources, types of shelter, etc. Ask students what else might live in the area they visited that they did not observe on that day.

References

Kalman, B. and Bishop, A. What Are Wetlands?

Fowler, A. Life in a Wetland.

Specialist Teams

Overview

This lesson is a follow-up to the “Refuge Expedition” lesson, but can be adapted as a follow-up for the refuge field trip

Duration

45 min sessions

Grades

5-8

Benchmarks

- Diversity/interdependence
- Dynamic Earth
- Forming a question/hypothesis
- Collecting & presenting data
- Analyzing & interpreting results

Key Concepts

Compiling, comparing, and sharing data collected from the field trip will give students a greater understanding of the complex ecosystem found at the Refuge.

Objectives

Students will be able to:

- explain how the earth and its processes affect this ecosystem
- explain how animals interact with this ecosystem
- explain how plants are an integral part of this ecosystem

Materials

- completed student handouts “Expedition Data Sheets”
- pencils
- map of Refuge (transparency for students to refer to)
- field guides

Background Information

See background information for “Refuge Expedition” lesson (found on page 133).

Suggested Procedure

1. Allow each expedition team to discuss their findings.
2. After the expedition teams have discussed their findings, have them form “specialist teams” so that the botanists, earth scientists, and zoologists can meet with one another. Specialist teams should summarize their findings for the habitat. Each “specialist team” should then elect one (or more) spokesperson to summarize their findings to the other specialist teams. Use the specialist presentations as an opportunity to help students form conclusions about the general characteristics and inhabitants of the habitat.
3. After each specialist group has presented their findings, ask each student to share something he/she learned or saw:
 - a. What was the most interesting?
 - b. How many different plants or animals did you find?
 - c. What did you learn about the physical components of the area?

Assessment Ideas

1. Have students develop a brochure that would make an ecotourist want to come visit this habitat. The brochure should include the findings of the zoologist, biologist, and earth scientist on the expedition team. It should include descriptions of the adaptations of at least one plant and animal found in this habitat. It should also include an illustration of a food web of the habitat.
2. Have students develop a PowerPoint presentation of their findings to present to the class.
3. As “specialists”, do a comparative study of the Tualatin River National Wildlife Refuge with an area near your school.

References

Rhythms of the Refuge: Educators Guide.

(adapted from Salt Marsh Manual: An Educators Guide)

Botanist's Presentation

Presentations must include some type of visual aid that adds pertinent information. In your presentation, be sure to answer the following:

1. Describe the habitats found on the refuge.
2. What types of plants grow in each habitat?
 - a. Be sure to include the classification of the plants
3. Evaluate if the plant life is diverse (balanced) or if there are dominant plants in each habitat.
 - a. If there is a dominant plant, what is it?
 - b. Is this plant an invasive plant?
4. Describe the plants' life cycles.
5. What stage of succession is the refuge in?
 - a. What evidence did you see for this?
6. What do you think the refuge will look like in 10 years? 20 years?
7. The primary function of the refuge is to provide habitat for migratory birds. As a botanist, evaluate if the refuge is meeting this goal.
8. Once the refuge is open to the public, what will the human impact be on the plant life? Be specific.
9. What suggestions do you have for U.S. Fish and Wildlife Service to reduce the effects of the human impact?

Earth Scientist's Presentation

Presentations must include some type of visual aid that adds pertinent information. In your presentation, be sure to answer the following:

1. Describe the cycles of matter that are occurring on or near the refuge.
2. Describe the habitats found on the refuge.
3. Describe the abiotic factors in each habitat.
4. Where does the water that feeds the refuge come from?
5. What types of environments does the water travel through before reaching the refuge (map)?
6. What is your assessment of the water quality at the refuge for each site you visited?
7. What kinds of biotic factors is the water capable of supporting? Be specific.
8. The primary function of the refuge is to provide habitat for migratory birds. As an earth scientist, evaluate if the refuge is meeting this goal.
9. Once the refuge is open to the public, what will the human impact be on the cycles of matter and water quality? Be specific.
10. What suggestions do you have for U.S. Fish and Wildlife Service to reduce the effects of the human impact?

Zoologist's Presentation

Presentations must include some type of visual aid that adds pertinent information. In your presentation, be sure to answer the following:

1. Describe the habitats found on the refuge.
2. What types of animals did you find in each habitat?
3. Evaluate if the animal life is diverse (balanced) or if there are dominant animals in each habitat.
 - a. If there is a dominant animal, what is it?
 - b. Is this animal invasive?
4. Describe the energy flow in these habitats. How are they different and similar?
5. What effects do water quality, terrain, and plant life have on the animals and energy flow on the refuge? Give examples.
6. The primary function of the refuge is to provide habitat for migratory birds. As a zoologist, evaluate if the refuge is meeting this goal.
7. Once the refuge is open to the public, what will the human impact be on the animal life? Be specific.
8. What suggestions do you have for U.S. Fish and Wildlife Service to reduce the effects of the human impact?

Water Quality Survey Analysis

Overview

Students will analyze and interpret the data they collected from the “Water Quality Survey” activity and make hypotheses and recommendations based on their findings.

Duration

30-45 min sessions

Grades

6-8

Benchmarks

- Forming a question/ hypothesis
- Collecting & presenting data
- Analyzing & interpreting results
- Diversity/interdependence

Key Concepts

Different aquatic organisms require different water characteristics. Humans can make improvements to riparian areas and bodies of water to enhance water quality.

Objectives

- Students will be able to:
- understand the role that water quality plays in an ecosystem
 - interpret and analyze the water quality data
 - recommend improvements to enhance water quality at the Refuge
 - determine changes they can make that will have a positive impact on the water quality in their watershed

Materials

- completed student handout “Water Quality Survey”
- pencils

Background Information

(This is the follow-up to the Water Quality Survey.)

The process of testing water is an engaging activity for students, but if they don’t stop and think “What does the data mean?”, a minimal amount of learning will take place. Their learning can be enhanced by helping them realize that they have the power to make a positive difference in the watershed (or world) around them.

Activities might include:

- Make posters to educate others about water pollutants such as pet waste and fertilizers.
- Write a “Letter to the editor” about a water-related environmental problem in your area.
- Plant shrubs and trees in a nearby riparian area.
- Call your local water bureau and find out if runoff (stormwater) from city streets is cleaned before it is allowed to enter creeks and streams. If it isn’t, find out why.
- Make children’s picture books about water and/or the Refuge. Take them to a local school and read them to the elementary students.
- Choose a water-related “Inquiry” experiment to research and do, then present your question and conclusion at a “Water” (Science) “Fair.”
- Make visual displays to exhibit at your local ESD.
- Pick up trash next to a nearby creek or pond.
- Find out if your local car wash recycles their wash water. If they don’t, ask why.
- Test the water quality of the drinking water in your school.

Vocabulary

woody debris—dead twigs, branches, limbs that are in the water
riparian area—the strip of land (20 m or more) that borders a pond, creek, river or other aquatic area

Suggested Procedure

Students should use the “Fact Sheet” and the data they collected in the “Water Quality Survey” at the Refuge to answer the “Analysis” questions. When they are finished, have them share their answers to questions 14 – 16. Extend this lesson by asking students to choose an activity they will do to put their learning into action. Have

students brainstorm ideas and make a list. (See Background for ideas.)

Assessment Ideas

Ask students the following questions:

1. How do specific water characteristics (pH, turbidity, temperature, etc.) affect the balance of a population in a pond, creek or river?
2. Name some of your daily activities that you could change that will have a positive impact on the quality of water in your watershed.

References

US Forest Service. Investigating Your Environment—Water.

Water Quality Survey Analysis

Use the Fact Sheet and the data you recorded on the Water Quality Survey
to answer the following questions about the pond and/or creek.

1. Name some examples of life that the water temperature could best support: _____

2. What would the water temperature most likely be, if you observed many fish with diseases?

3. Which water temperature range supports the most life? warmer or colder
4. What is probably the cause for the color of the water? _____
5. Which water color would indicate the most fish food productivity? _____
6. If the water were clear, would you expect to find many or few fish? _____
7. A perfect riparian area would include _____
Why would it include these? _____

8. How could you help prevent erosion in a riparian area or along a stream bank? _____

9. According to the pH measurement of the water, what types of aquatic life would you expect to find? _____
10. Which four organisms require a near neutral pH level to survive? _____

11. Are there bacteria living in the water you tested? _____
How do you know? _____
12. What effect does woody debris have on the creek? _____

13. What improvements would you make to the pond, and why you would make them? _____

14. What improvements would you make to the creek, and why you would make them?

15. What factors influence or change the balance of populations in a pond or creek? _____

16. What changes can you make in your daily life activities that will have a positive impact on the quality of water in YOUR watershed? _____

Fact Sheet

Relationship of Water Color to Productivity

The quantity of life that may be present in a body of water and available for other organisms to eat, is often referred to as the "productivity" of the water.

Color of Water		Most Likely Cause	Fish Food Productivity
Clear		Absence of algae and micro-organisms	Low
Greenish hue		Blue-green algae	Moderate
Yellow to Yellow-brown		Diatoms—microscopic, one-celled algae	Moderately High
Red		Micro-crustaceans	High
Dark brown		Peat, Humus	Low
Geological Factors that Affect Color			
In limestone geology	Green	Abundant calcium	Moderate
In volcanic geology	Yellow-green Red	Abundant sulfur Abundant iron	Low Moderate

Temperature Ranges (Approximate) Required for Organisms

Temperature	Examples of Life
<u>High Range—warm water</u> Greater than 68°F or 20°C	Much plant life, many fish diseases Mostly bass, crappie, bluegill, carp, catfish, caddis fly
<u>Middle Range</u> 55°F - 68°F 14°C - 20°C	Some plant life, some fish disease. Salmon, trout, stone fly, mayfly, caddis fly, water beetles
<u>Low Range—cold water</u> Less than 55°F or 14°C	Trout, caddis fly, stone fly, mayfly

pH Ranges That Support Aquatic Life

	Most Acid					Neutral				Most Alkaline				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bacteria	1.0 13.0													
Plants—algae, rooted, etc.						6.5					12.0			
Carp, suckers, catfish, some insects						6.0			9.0					
Bass, crappie						6.5			8.5					
Snails, clams, mussels							7.0			9.0				
Largest variety of animals—trout, mayfly, stone fly, caddis fly						6.5		7.5						

Service Learning in the Environment

Overview

Service Learning is a strategy or tool educators can use to teach students about themselves and the world around them. Students will work in teams or individually to choose a project. If every school in the country would do one Service Learning project, it could change the world.

Duration

Varies

Grades

K-8

Benchmarks

Varies, depending on the project

Key Concepts

If students choose their own project and put their ideas into action, it will be an experience they will never forget. Young people are able to cut through red tape and get results. Unlike adults, students don't know ahead of time all the reasons why something might not work. Instead of making excuses, they take action.

Objectives

Students will:

- identify problems and come up with solutions by making a plan, taking action and
- reflecting on the outcome
- learn the value of civic responsibility by actively participating in the community

Materials

Varies, depending on project

Background Information

Service learning helps students think outside of the classroom and take a look at real world issues. Kids are creative thinkers. As a class, brainstorm different environmental projects (see "Ideas for Service Learning"). Review the list together and discuss feasibility of the projects. Eliminate those that (realistically) would be too difficult to accomplish within your timeframe. Have students write down their top 3 choices and come back tomorrow with a proposal for one of them. If students are allowed to choose their own project, they will take ownership and be more invested in the results.

After students have selected a project, they can begin the learning process. It should be divided into five steps:

Research: What do I need to know about the problem before I begin?

Goal: What do I want to accomplish?

Planning: What steps do I need to take to meet my goal?

Action: Do it!

Reflection: What did I learn from each step of the process?

Suggested Procedure

Ideas for Service Learning

1. Determine how much trash your school generates and challenge students and staff to reduce the amount every month for the school year.
2. Decorate bins or buckets for classrooms to place recyclables. Put one in every classroom.
3. Adopt an area to keep clean by picking up trash.
4. Paint a mural with an environmental emphasis to educate others.
5. Decorate grocery bags with environmental slogans (Like trees?? Recycle Paper, Don't litter; keep our community clean) and distribute at a local grocery store.
6. Develop a plan to conserve water and electricity at home. Do it.
7. Make compost from school food waste by using worms in bins. Use the compost in a school garden or give it to neighbors.
8. Find a local environmental issue that your community is facing and do something to make a positive difference.
9. Plant trees at a park or next to a stream to create shade, oxygen and beauty.
10. Monitor the water quality of a nearby stream or creek. Write a letter to the City Council or Editor of the local newspaper

suggesting what citizens can do to help improve the water quality.

11. Research drought resistant plants for your area and water conservation tips. Make brochures to distribute to neighbors.
12. Plan a school wide recycling program. Make a power point presentation to take to different classrooms showing students how easy it is and the benefits. Do it.
13. Assign a specific hallway in the school to a different class to keep clean for a week or month. Have a competition to see which class does the best job.
14. Write poetry about taking care of the environment in different languages and compile it into a book to give to others.

Assessment Ideas

1. What did you learn?
2. What did you accomplish?
3. What were your feelings, fears, joys?
4. Would you do it again? Why?
5. How could you improve it?

References

Berger Kaye, C. The Complete Guide to Service Learning.

Lewis, B. The Kid's Guide to Service Projects.

Lewis, B. The Kid's Guide to Social Action.

Attracting Wildlife to Your School

Overview

Students map school grounds and existing wildlife habitat and develop plans for improving the habitat in order to attract wildlife.

Duration

45 min

Grades

4-8

Benchmarks

- Diversity/interdependence
- Dynamic Earth
- Forming a question/hypothesis
- Collecting & presenting data
- Analyzing & interpreting results

Key Concepts

Attracting wildlife requires knowledge of animals and their habitats.

Objectives

Students will be able to:

- create a map of their school site
- make an inventory of existing habitat at or around their school
- develop a plan for improving wildlife habitat at or around their school
- practice/simulate “wildlife management” on their own school grounds

Materials

- map of school/campus
- construction paper
- markers
- pens
- crayons
- pencils

Background Information

Your schoolyard can be a rich wildlife habitat that provides the basic needs of animals – food, water, protection and space – in the appropriate arrangement. You can attract desirable wildlife to your school by planting native shrubs and trees, providing supplemental food, making a birdbath, and constructing nest boxes. If space is limited, students can build a window box planter, and set out a dish of birdseed and a pan of water.

Planting for Wildlife

Urban and schoolyard habitats require variety; the richer the plant diversity, the richer the wildlife. A mix of trees, shrubs, and herbaceous plants in clusters, and a variety of plant heights, provide a diverse habitat. Herbaceous plants are non-woody broad-leaved plants such as sunflowers and goldenrod. You can create edges or borders by planting trees, shrubs and flowers around open areas. More wildlife will congregate where shrubbery and lawn meet.

Trees are magnets for wildlife. They provide food, protection, and nesting sites for butterflies, birds, and small mammals. Shrubs attract the greatest diversity of schoolyard wildlife. They grow faster and have fewer requirements than trees. Colorful annuals and perennials attract butterflies and hummingbirds.

Water Sources

Water is essential to wildlife habitat. A birdbath, small pool, or pond will attract a variety of birds and small mammals. A birdbath can be as simple as an upside-down aluminum garbage can lid that is set in the ground and filled with water.

Bird Feeders

Bird feeders come in all shapes and sizes. You can make feeders out of simple materials, such as plastic margarine containers, egg cartons, milk cartons, and coconut shells. Feeding stations can be placed at four heights: ground level, tabletop, hanging, and tree trunk. To attract towhees, juncos, and mourning doves, you can simply scatter seed on the ground. Ground feeding areas should be in the open, away from places where cats may hide. Tabletop or platform feeders will attract finches, chickadees, grosbeaks, jays and migrating warblers. Tree trunk feeders containing suet are excellent for attracting woodpeckers and nuthatches. Suet, a dense beef fat, is one of the best cold-weather bird foods. Another favorite winter food for birds is sunflower seeds. They are high in calories and are a good source of energy. Thistle (or Niger) seed is essential for attracting goldfinches and pine siskins.

Wildlife Homes

Wildlife homes provide nesting areas and protection from predators and the elements. You can custom-make bird nest boxes from cedar or pine. Bat boxes will encourage bats to roost at your site in the summer, and a colony of bats means fewer insect pests.

Boxes for overwintering butterflies help protect these fragile insects in severe weather. This allows them to grace your area on sunny days. Brush piles made from pruned tree branches and old Christmas trees make nice hideouts for rabbits and chipmunks. Rock piles and rock walls with plenty of crevices are attractive to friendly garter snakes and toads, which are good insect predators.

Extra Guests

Remember when you provide habitat for one species, other uninvited species may also be attracted to the site. For example, if you set out food and water for birds, raccoons and deer may also help themselves to the feast. Giving these mammals supplemental food is usually discouraged or prohibited in most communities.

Suggested Procedure

1. Preparation: Make a base map of your school grounds for every two to four students. You can do this yourself or with the class. Draw an outline of your school grounds on the butcher paper. Draw an outline of the school building, roughly to scale, on construction paper. Trace the school shape on the butcher paper in the proper location.
2. Divide the class into teams of 2 – 4 students. Distribute a base map to each of them.
3. Have students create a map key. (You may want to have them include symbols for trees, shrubs, grass/lawn, weeds and wildflowers, rocks, hard dirt areas, flower beds, old stumps, fallen logs, etc.). Assign a color to each component for use in later map comparisons.
4. Each team should have a base map, map key, a set of markers or crayons. Students will be taking an inventory of their school site to

identify natural and human-made features. Ask them to draw the existing features on their maps using the symbols and colors on their map keys. Mention to younger students that a precise scale for the map is not necessary; they need only draw symbols at their approximate locations. You may want older students to draw a to-scale map.

5. On their maps, students can draw and label features that are not included in the key. These features might include parking lots, sidewalks, a playground, and fences.
6. While taking the inventory, students might think about the following: which areas would make good wildlife habitat? Why? (Nesting holes in trees, dense vegetation for protection, and food plants are good habitat) Which areas could be improved for wildlife? How? (Planting trees, constructing nest boxes, and picking up trash all improve habitat.)
7. Have teams compare their completed maps. Which colors are dominant on their maps? Discuss the quality of the school site in terms of attracting wildlife and its potential for improvement. Discuss which wildlife species students would like to attract and research the habitat needs of those animals. Make a list of native trees, shrubs, and flowers best suited for attracting wildlife in your area.
8. Discuss with the students how they are using the tools and knowledge of wildlife management in making their plan.
9. Have students draw some of their habitat ideas for the school grounds on their base maps.

Extension/Adaptations

Students should pick an idea for improving their school site and begin working on it. Ideas: planting drought resistant trees and shrubs, providing a water source for animals, making bird feeders and nest boxes and constructing brush piles for animal protection.

Invite a representative of a local garden

club, Audubon Society, Cooperative Extension Office, or city parks department to discuss planning for schoolyard wildlife. What does the organization do to help wildlife? Ask the speakers to bring pictures or slides.

Assessment Ideas

1. Maps of school grounds.
2. Plans developed for improving schoolyard for wildlife.

References

Rhythms of the Refuge: Educators Guide.
(adapted from Salt Marsh Manual: An Educators Guide)

students prepare visuals to depict their watershed and present their design to the class.

Resources:

Oregon Department of Fish and Wildlife.
The Stream Scene: Watersheds, Wildlife and People.

Additional Resources

Exploring Your Watershed

Since everyone lives in a watershed, first explore the boundaries of your own. Obtain a topographic map of your area from a library or website.

1. Trace the lines along the high points that separate your creek or river from the next. Map the land use in your watershed (e.g., streets, forests, farms, yards, etc.)
2. List all the possible places that water goes in your watershed.
3. Go outside the school building. What happens to the rain when it falls on the school roof? Does any of it travel to a stream or river? How does it get there? Is it treated to remove pollutants before entering a stream or river?
4. Collect newspaper clipping about watershed management problems in your area.
5. In small groups have students design their own watershed. Each design should include: location, climate, uses of, abuses to, human impact on and group perceptions of what a watershed should and should not be. Have

Make a Mini Wildlife Refuge

Overview

This lesson is designed to help students apply and personalize the concept of a national wildlife refuge.

Duration

Two 45 min sessions

Grades

5-8

Benchmarks

- Diversity/interdependence
- Dynamic earth
- Forming a question/hypothesis
- Collecting & presenting data
- Analyzing & interpreting results

Key Concepts

Create a miniature refuge and try to “manage” this land as a national wildlife refuge.

Objectives

Students will be able to:

- explain reasons why refuges are needed
- describe the characteristics of refuges
- list problems facing refuges

Materials

- clipboards
- paper
- pencils
- hand lenses
- one 5 m piece of string
- meter stick

Background Information

(Also see background information in Pre-visit Activity “What is a National Wildlife Refuge”)

There are over 530 national wildlife refuges; these refuges include a diversity of habitats, including tall grass prairies, wetlands, arctic tundra, and estuaries, just to name a few. The Refuge System forms a valuable network of lands for the conservation of a wide diversity of fish, wildlife, and plants.

Refuges support 22 percent of threatened and endangered species. Some refuges were acquired with the specific purpose of helping threatened and endangered species. Several of the early refuges helped to rescue bison and elk from extinction. Merritt Island NWR (Florida) has more endangered species than any other refuge. Setting aside land in refuges benefits present and future generations of wildlife and people.

Waterfowl Production Areas (WPAs) are also a part of the Refuge System, and they provide critical habitat for waterfowl as well as other wildlife. Waterfowl Production Areas became a part of the Refuge System in 1966. There are over 3,000 WPAs in the United States, and they cover over 668,000 acres. Most WPAs (almost 95 percent of them) are located in North Dakota, South Dakota, Minnesota, and Montana. Many WPAs are in prairie wetlands called prairie potholes. These wetlands are often temporary and may not be wet throughout the year, but they provide critical habitat for wildlife on the prairie landscape. They are open to the public for hunting, fishing, trapping, wildlife observation photography, environmental education and interpretation.

The primary purpose of refuges is for conservation and management of fish, wildlife, and plants for the benefit of people. If treated with respect today, refuges will provide enjoyment and other benefits to the generations of tomorrow.

Suggested Procedure

1. Discuss the concept of a national wildlife refuge with your students. Ask the students what makes a refuge different from an open space area, national park, city park, etc.? Who owns a national wildlife refuge? Why establish a national wildlife refuge?
2. Brainstorm with students what they would want/need if they were to create a “perfect” refuge.
3. Group the students (2-3 per group) and distribute the materials.
4. Assign, or let each pair choose, an outdoor spot for their miniature national wildlife refuge. Using their string, they should rope off

their mini-refuge using the scale: 30 cm = 1 mile.

5. Students should move about their mini-refuge on their hands and knees. Using their hand lenses, the students should try to determine the areas that will be good habitat for wildlife. Remind them that 30 cm = 1 mile of a full-size refuge. Are there any scenic areas? Are there good spots for observing wildlife without undue disturbance? Provide them with examples, showing them how a hole could be considered a canyon, a puddle considered a lake, etc.
6. Give the class approximately 20 minutes to set up their mini-refuge and to establish any trails in their mini-refuge.
7. After the students have marked their mini-refuge's boundaries using string, they should begin making sketches and taking notes for a brochure of their mini-refuge. The finished brochure should include drawings of several plants or animals that visitors might see at the mini-refuge. (For older students you may want to require that the map of the refuge is drawn to scale.) The brochure can be completed inside later, but any necessary notes and sketches should be made during this time period outside.
8. Once the mini-refugees are set up, the students may want to encourage people to come and learn about their mini-refuge. Split up the student groups; one student should stay at the mini-refuge; the other(s) should visit the other mini-refuges. The student who stays must educate the visitors about the mini-refuge. (Allow the pairs to switch – each student should visit at least one mini-refuge)
9. After they have visited the other mini-refuges, ask the students the following questions:
 - a. Were people excited to learn about their mini-refuge?
 - b. Were visitors always careful with the mini-refuge's resources?

c. Did they have too many visitors?

d. What would they change?

e. What problems occurred?

10. Provide time back in the class for students to complete their brochures, or assign the brochures as homework.

Assessment Ideas

1. Brochures of mini-refuges
2. Discuss: What can you do to help protect the plants and animals on a national wildlife refuge? Who has the responsibility of protecting refuges for future generations? What about the plants and animals in your backyard?

References

Rhythms of the Refuge: Educators Guide.
(adapted from Salt Marsh Manual: An Educators Guide)

Manage a Mini Wildlife Refuge

Overview

Students are given a small plot of land that is their mini-refuge. They are provided with descriptions of a particular species for which they develop a management plan. Can be used with "Make a Mini-Wildlife Refuge" activity.

Duration

Two 45 min sessions

Grades

4-8

Benchmarks

- Diversity/interdependence
- Dynamic Earth
- Forming a question/hypothesis
- Collecting & presenting data
- Analyzing & interpreting results

Key Concepts

Refuge management requires specific knowledge of species and habitats, and keeping all aspects in balance.

Objectives

Students will be able to:

- explain changes that can be made to a habitat as part of a management plan
- discuss how management can be complex and involve making difficult decisions and choices

Materials

- clipboards
- species cards
- string to mark off mini-refuge boundaries
- student handouts "Refuge Management Plan" and "Management Tools"

Background Information

The term "natural resource" is a broad term, but it can be defined as those products of the natural world that are of value to humans. Thus, a natural resource can be an animal, plant, mineral, open space, and even a human experience in the outdoors. Wildlife is often called a natural resource. Wildlife management is defined as: the application of scientific knowledge and technical skills to protect, conserve, limit, enhance, or extend the value of wildlife and its habitat

By its very definition, management must have particular goals. For example, an area could be managed in order to improve nesting habitat for waterfowl. Or, a pond could be managed to increase the populations of certain fish species. The management goals determine which techniques will be used on a piece of land or body of water.

Who is responsible for the wildlife on public and private lands in the United States? By law, wildlife is publicly owned in the United States. This means that even when land or water is owned by a private citizen, the wildlife on that land is still publicly owned, with few exceptions. Thus, State and Federal governmental agencies are primarily responsible for wildlife. State agencies emphasize the management of non-migratory wildlife. Federal agencies, especially the U.S. Fish and Wildlife Service, emphasize management of migratory species, certain marine mammals (sea otters, polar bears, walrus), wildlife that resides on refuge land, and threatened and endangered species.

Management of wildlife can be direct or indirect. Direct management involves manipulation of the plant or animal population. An example of direct management is hunting and its regulation. Indirect management involves altering the habitat to favor or inhibit target species. For example, prescribed fires are sometimes used to remove excess dead plant material, control woody species, and improve nutritive content of plants. Grazing is also used as a management tool.

Management tools used on Tualatin River National Wildlife Refuge

See information under Introduction Section.

Suggested Procedure

1. Select an area in the schoolyard (perhaps along the perimeter) that has several different habitat types in somewhat close proximity to one another. If this is not possible, the activity will work if students are given different areas in the same habitat type.

2. Discuss the concepts of wildlife management including direct and indirect management with the students.
3. Divide the students up into teams of 3 –
 4. Tell them they are about to become managers of a new mini-refuge. As managers of a mini-refuge, students will be managing for a particular species of wildlife. They will be provided with a species card that includes a description of a species and its habitat requirements. Distribute species cards and Student Pages.
4. Review what student should accomplish while “managing” the mini-refuge:
 - a. Students will determine what kind of habitat their mini-refuge has on it.
 - b. Draw the mini-refuge in its current condition. (For older students, you can have them draw the map to scale. If you want them to draw the map to scale, you may want to provide graph paper).
 - c. Assess how well the mini-refuge meets their species’ needs. What habitat components are already present? What is missing? Is there anything they can do to make their mini-refuge better for their species (add ponds, plant important food species, etc.)?
 - d. Develop a management plan for their mini-refuge and write it on the Student Page. They can refer to their Student Page “Management Tools” for ideas of ways to manage their mini-refuge. A good management plan includes:
 - i. A map of the mini-refuge, including boundaries, stream, pond, trail, road, and restroom areas
 - ii. A list of the management tools selected
 - iii. Reasons for selecting the management tools.
5. Assign, or let each team choose, an outdoor spot for their mini-refuge. Using their string, they should rope off their mini-refuge (scale 30 cm = 1 km). Try to provide strings of different length to different teams to help illustrate that refuges vary in acreage.
6. Allow approximately 30 min. for student teams to develop their management plans. Monitor progress.
7. Bring the students back together and allow each group to give a short description of their mini-refuge, including the mini-refuge’s name, focal species, and chosen management tools.
8. Discuss the different options that each group chose in the management of their mini-refuge. Ask:
 - a. What would have happened if you were told to manage for a different species?
 - b. What if you needed to manage for several different species at the same mini-refuge? How would that have made your choices more complicated? Is managing for several species more realistic? (You can illustrate this idea by asking a group what they would change in their management plan if they had to manage for their group’s species as well as another group’s species.)
 - c. Did it help to have a few different habitat types on a mini-refuge? Why? (Habitat diversity can often offer a species more of its requirements than one habitat)
 - d. Is it possible to cooperate with another mini-refuge in a way that is beneficial for both refuges?
9. Discuss some of the management tools used on the Tualatin River National Wildlife Refuge. Remind students to look for areas on the refuge where they can see evidence of these wildlife management tools. Have they seen any such areas anywhere else?

Extension/Adaptations

Have students manage for more than one species on the mini-refuge.

Determine how much public use you

would have on the mini-refuge, and the impact this would have on the mini-refuge.

Assessment Ideas

1. Student Handouts.
2. Have each student team evaluate and offer suggestions for another student team's management plan.
3. Provide a map of another mini-refuge to students. Ask them to develop a management plan for their species on the new mini-refuge using the information provided on the map.

References

Rhythms of the Refuge: Educators Guide.
(adapted from Salt Marsh Manual: An
Educators Guide)

Example Species Card: Wood Duck (*Aix sponsa*)

Food	<p>Wood ducks eat a variety of foods, including acorns, seeds, berries, grain (from agricultural fields), aquatic plants, aquatic and terrestrial insects, and other invertebrates.</p> <p>Adults: Acorns are a staple diet of the adult birds. So, good habitat often has mature oak trees that supply the acorns. Adults can feed some distance from open water.</p> <p>Ducklings: Insects are an important food for ducklings.</p>
Water	<p>As aquatic birds, wood ducks are highly adapted to life in the water. They spend a great deal of their lives on or near forested wetland habitat, marshes, and beaver ponds.</p>
Shelter	<p>Wood ducks need areas with flooded shrubs, trees, or both shrubs and trees. Wood ducks do not nest on the ground – they need tree cavities or nest boxes. Cavities are usually at least 5 feet above the ground. Also, a nest cavity entrance that is less than 4 inches in size is safer from predators than a larger hole.</p> <p>Tree cavities: Trees that are greater than 16 inches in diameter often provide the best cavities. Sometimes, females will use an abandoned nest hole of another species.</p> <p>Artificial Nest Boxes: Nest boxes should be placed along shallow pond edges where there is abundant vegetation in which ducklings can hide.</p>
Space	<p>The maximum density of wood duck nests may be 7 nests per acre.</p>
Arrangement	<p>It is not enough to have food, water, shelter, and space. These elements must be in the proper arrangement. For the wood duck, food must be near permanent water. The nest cavity or box should be less than ½ mile from open water. Also, once hatched, ducklings survive better in sheltered areas that also have food. Shoreline pond vegetation can provide shelter for ducklings and insects for them to eat.</p>

Other species that can benefit from Wood Duck management: mallard, black duck, hooded merganser, great blue heron, yellow-rumped warbler, prothonotary warbler, belted kingfisher, swamp sparrow, pileated woodpecker, red-headed woodpecker, screech owl, red-bellied water snake, painted turtle, bullfrog, and beaver.

Management Tools

Management Tools	What does this tool do for wildlife and their habitat?
Artificial Feeders	Used mostly to feed wildlife in urban/suburban areas
Brush Piles	Increases the amount of protection for species like rabbits and quail
Prescribed Burning	Can encourage plant growth and make plants more nutritious Can decrease the number of shrubs and trees Can improve water and protection conditions in a wetland that has too much vegetation.
Create Dams	Raises the water level and creates pools Provides fish with a place to rest and hide
Fertilize Vegetation	Makes plants more nutritious for herbivores (mule deer, etc.)
Leave Grain Unharvested	Provides food and protection for a variety of wildlife
Decrease Hunting/Fishing	Decreases the number of animals that can be hunted/fished Helps populations of animals to increase in number
Increase Hunting/Fishing	Increases the number of animals that can be hunted/fished Needed when the population is too high – crowded habitat, animals are in poor condition (thin), or there is lots of fighting
Grazing	Improves nutritional value of vegetation Improves water and protection conditions in a wetland that has too much vegetation
Nesting Structures	Some species nest in cavities or in large tall trees Nesting boxes and platforms can help these species during breeding season
Plant Trees/Shrubs	Provides food for some wildlife (buds, leaves, acorns, nuts) Can block the wind and provide protection
Build Pond/Wetland	Benefits fish and water birds
Deepen Pond Edges	Improves pond for fish Decreases the amount of vegetation around pond edges
Transplant Animal or Plant	Can be done with all kinds of organisms Brings an organism into a suitable habitat if it cannot get there on its own
Perching/Roosting Platforms	Some species roost or search for food from trees/tall shrubs

Refuge Management Plan

Team Members:

Mini-refuge Name:

Species we are managing for:

1. Map of the mini-refuge: Draw the mini-refuge as it looks before you make any changes.

Map Scale:

2. Look at your species card. The mini-refuge may or may not have everything your species needs. Make a list of what the mini-refuge has for your species and what the mini-refuge needs for your species.

_____ The Mini-refuge has:

_____ The Mini-refuge needs:

3. What management tools can you use to make the habitat on the mini-refuge better for your species?

Management Tool	How will this management tool improve the habitat for the species?

4. On your map, draw any changes to the land that will occur because of your management plan. Use a different color so it is easy to see the changes that result from your management plan.

5. Is there nearby land that would help improve the mini-refuge for your species (if you could buy it)? Describe the habitat of this land. What does it have that would help your species?

6. How will you know if your management plan is successful? How will you know if you need to make changes to your management plan?